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DDC

RECEIVED
JUL 20 1977

11 OTTAWA

JAN 1977

12) 44p.

ISSN 0077-5566

This Supplement lists reports published subsequent to those recorded in the Publications of the Division of Mechanical Engineering and the National Aeronautical Establishment, Series No. 2, Supplement No. 5.

Copies are available by writing to the Publications Section, National Aeronautical Establishment, National Research Council Canada, Montreal Road, Ottawa, Ontario, K1A 0R6.

Ce supplément est une liste de rapports publiés, consécutifs à ceux enregistrés dans Publications de la Division de génie mécanique et de l'Établissement aéronautique national, série no. 2, supplément no. 5.

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PART I — AERONAUTICAL REPORTS

LR-572 ESTIMATES OF THE LATERAL-DIRECTIONAL STABILITY DERIVATIVES OF A HELICOPTER FROM FLIGHT MEASUREMENTS.

Gould, D.G., Hindson, W.S., National Aeronautical Establishment, December 1973.

The lateral-directional stability derivatives for a medium-sized single rotor helicopter have been estimated for three different forward speeds. The analysis technique is based on a least squares quasilinearization method which employs a specially formatted parameter vector so that reliable *a priori* estimates can be used to assist convergence. An additional unique feature is the procedure adopted to reduce the influence of unknown atmospheric inputs on the parameter estimates by means of a conglomerate analysis of several similar runs.

LR-573 MODIFICATION OF V/STOL INSTRUMENT APPROACH GEOMETRY AS A MEANS OF COMPENSATING FOR ALONG-TRACK WIND EFFECTS.

Hindson, W.S., Gould, D.G., National Aeronautical Establishment, January 1974.

The influence of wind on the low speed approach and landing considerations for V/STOL aircraft poses new problems which, although neglected for conventional aircraft, may require specific solutions for these new designs. A novel method to allow for significant along-track wind effects, including shears, is proposed whereby the approach geometry relative to the earth is modified according to the ambient wind condition.

LR-575 WALL INTERFERENCE ON TWO-DIMENSIONAL SUPERCRITICAL AIRFOILS, USING WALL PRESSURE MEASUREMENTS TO DETERMINE THE POROSITY FACTORS FOR TUNNEL FLOOR AND CEILING.

Mokry, M., Peake, D.J., Bowker, A.J., National Aeronautical Establishment, February 1974.

The effects of unequal porosity factors, ascribed to the floor and ceiling of two-dimensional wind tunnel test sections, are investigated with a simplified mathematical model that utilizes a point vortex and a point doublet placed mid-way between the two walls. Closed form solutions are derived, using the method of images, for wall pressure distributions, and corrections to Mach number and model angle of attack.

The predicted wall pressure distributions are compared with experimental results obtained in the National Aeronautical Establishment 15x60 inch high Reynolds number two-dimensional test facility for three airfoils with thickness-chord ratios from 0.10 to 0.17 and chords of 10 and 15 inches. Agreement is shown to be markedly better than is possible with equal porosity factors. Reasonable agreement continues up to tunnel mainstream Mach numbers of about 0.82, providing confidence in the derived blockage and angle of attack corrections.

LR-576 ACOUSTIC TESTS ON A FAN-IN-WING MODEL: EFFECTS OF AN EXTENDED INLET.

Krishnappa, G., Division of Mechanical Engineering, February 1974.

This study describes the comparative acoustic tests conducted on a 12 in. diameter fan-in-wing model with an extended inlet referenced to the standard shallow inlet. The aim of the tests was to find the effect of extending the depth of the inlet on the noise radiation characteristics of the fan, both at static and crossflow conditions. The studies also included induct sound measurements done to observe the change in the characteristics of the blade passing frequency tones due to crossflow over the fan.

The extended inlet showed generally higher broadband noise levels and shaft order tone levels, both at static and crossflow conditions, which were particularly noticeable at high fan speeds. There were no large differences in the far field tone levels and directionality patterns of the blade passing frequency tones between the two inlets. In-duct sound measurements showed minor changes in the characteristics of blade passing frequency tones due to crossflow velocities.

LR-577 RESULTS OF INTERCOMPARISON FLIGHTS BETWEEN THE NAE T-33 AND THE NCAR BUFFALO ATMOSPHERIC RESEARCH AIRCRAFT.

MacPherson, J.I., National Aeronautical Establishment, July 1974.

Recent international atmospheric research programs such as BOMEX and IFYGL have been of such a large scale that several aircraft are required to collect data, which, when combined with radiosonde and surface measurements, ultimately form a large internationally-accessible data bank. A fundamental part of the program, and one which rarely receives enough attention, should be an intercomparison between the measuring aircraft. This report presents results of two such intercomparison flights between the NAE T-33 and NCAR Buffalo atmospheric research aircraft, with the NCAR Sabreliner providing additional data on one of the flights.

Data from these flights, which were flown at different altitudes on two days with quite different atmospheric conditions, show generally good agreement, particularly for mesoscale meteorological parameters averaged over the length of a run. Spectra of microscale variables including true gust velocity, heat and momentum flux are compared over a frequency band common to both aircraft. The spectra for longitudinal gusts and temperature fluctuations show excellent agreement between the aircraft, but discrepancies are apparent in the Buffalo vertical gust spectra and resultant fluxes during these flights.

LR-579 GAS TURBINE CYCLE CALCULATIONS: THERMODYNAMIC DATA TABLES FOR AIR AND COMBUSTION PRODUCTS FOR THREE SYSTEMS OF UNITS.

Chappell, M.S., Cockshutt, E.P., Division of Mechanical Engineering, August 1974.

Thermodynamic data tabulations specifically designed for gas turbine cycle calculations are presented for 1° intervals from 200 K to 2200 K, and from 350°R to 4000°R. The tables are similar to those of Fielding and Topps, but are rather simpler to use. They are presented in the following systems of units:

- | | | |
|--------------------------|---------------------------|-------------------|
| (a) Engineering Units, K | (b) Engineering Units, °R | (c) S.I. Units, K |
|--------------------------|---------------------------|-------------------|

Numerical examples illustrating their use are included. The polynomial coefficients used to generate the tabular data are also given, should the user wish to evaluate the properties within a computer program.

The present data were previously published as NRC LR-517 (Reference 5) for the first two sets of units with an upper temperature limit of 2000 K. This publication repeats them without change, together with new tables in S.I. units, and extends the upper temperature limit to 2200 K (4000°R).

LR-580 REVERIFICATION OF THE NAE 100,000-LB. DEADWEIGHT STANDARD FORCE MACHINE.

Gwilt, S.R., Stimson, E.B., National Aeronautical Establishment, September 1974.

After approximately thirteen years of continuous operation since its initial installation and calibration, the Canadian 100,000-lb. standard deadweight machine was disassembled for reverification of the forces exerted by its suspended masses.

The machine is briefly described and the principles of force determination examined. A section outlines the use of the observed data, including a statistical analysis to demonstrate control of the balance operations, and an examination of sensitive areas such as temperature differential effects, buoyancy effects due to mixed material densities, and observation of gradual deterioration of balance sensitivity.

Final development indicated total uncertainties of the order of four parts per million associated with the listed forces.

LR-581 SPATIAL INSTABILITY OF COMPRESSIBLE WAKES WITH THREE-DIMENSIONAL DISTURBANCES.

Chan, Y.Y., Leong, R.K., National Aeronautical Establishment, November 1974.

The linear spatial stability of a compressible thin turbulent wake bound by two side walls is analyzed by the stability theory of an inviscid shear flow. The disturbance propagating in the wake is assumed to be three-dimensional. For free stream Mach numbers up to 2 the analysis shows that in the high frequency region the most unstable mode of the wake is induced by two-dimensional disturbances. However, at the low frequency region the wake is more unstable to three-dimensional disturbances than to two-dimensional ones.

LR-582 CORRELATION OF FATIGUE DATA FOR ALUMINUM AIRCRAFT WING AND TAIL STRUCTURES.

Hangartner, R., National Aeronautical Establishment, December 1974.

S-N curves are derived for aluminum wing and tail structures by fitting various regression models to 246 full-scale constant-amplitude fatigue test results from twelve types of aircraft structures. The derived curves were tested by comparing the predicted lives with actual test results of various aircraft structures fatigue tested to variable-amplitude loads spectra. More reliable predictions resulted from these derived S-N curves than from existing S-N curves.

LR-583 THE SPREADING OF A LIQUID DROP ON A PLANE SOLID.

Drummond, A.M., National Aeronautical Establishment, January 1975.

The theoretical spread factor analysis has been experimentally verified for drops less than about 450 μ . For larger drops, the spread factor is larger than that theoretically predicted which implies a smaller contact angle for larger drops. Perhaps the receding contact angle is smaller than the advancing contact angle for large drops and may be the dominant cause of the discrepancy. The generation of large drops of uniform size by cyclic jet perturbation is very easy but drop spectrum distortion due to coalescence for small diameter jets (small drops) rules out the technique used in these experiments as a practical method for producing sprays with a narrow droplet size spectrum.

LR-584 A FINITE ELEMENT PROCEDURE FOR PLATES WITH CURVED BOUNDARIES.

Hrudey, T.M., National Aeronautical Establishment, January 1975.

This report considers the difficulties involved in the finite element solution of plate problems which have curved boundaries. Previously used techniques for such problems are discussed and a new procedure is suggested which overcomes the problem of satisfying the displacement boundary conditions on a curved boundary. A number of circular and elliptic plate problems are solved using two previously used techniques in addition to that proposed here. The latter is found to be superior in all cases.

LR-585 NONLINEAR SPATIAL WAVE DEVELOPMENT IN AN AXISYMMETRICAL TURBULENT JET.

Chan, Y.Y., National Aeronautical Establishment, April 1975.

This report gives the detailed analysis of the nonlinear development of a spatial-growth wave disturbance in the turbulent shear layer of a circular jet. A concise version of the present problem has been published in the *Physics of Fluids* (Ref. 2). The method of analysis is based on the global consideration of the energy transfer between the mean flow, the turbulence and the wave fluctuation in the shear layer. For the correlation functions required for the integral formulation, those of the mean and the turbulent flows of the jet are calculated numerically by a finite difference method, and those of the wave fluctuations are obtained from a linear stability theory of a divergent flow. The predicted development of the wave is in good agreement with the experimental data.

LR-586 A NUMERICAL DETERMINATION OF THE BOW SHOCK WAVE IN TRANSONIC AXISYMMETRIC FLOW ABOUT BLUNT BODIES.

Jones, D.J., South, J.C. Jr., National Aeronautical Establishment, May 1975.

A numerical method is developed for calculating axisymmetric transonic ($M > 1$) flow about a blunt body. The bow shock wave location is of particular interest. A Rankine Hugoniot jump is applied at the shock while relaxation on the isentropic equation of motion is used between shock and body. The shock wave is adjusted by a Newton type iteration scheme. Results are given for a sphere in the Mach number range 1.62 down to 1.02.

LR-587 VISCOUS FLOW INSTABILITY ON THE EDGE OF A SPINNING DISC.

Drummond, A.M., National Aeronautical Establishment, July 1975.

The flow of a thin film of viscous fluid on a spinning disc with a circular arc edge is considered. An approximate film thickness relation is derived which agrees well with experiment. A linearized free-surface instability theory is developed to predict the number of atomization sites at the disc edge. It is concluded that the experimentally determined mean number of atomization sites is within 10% of the theoretical prediction and that 90% of the data will be within a calculable band about the theoretical line, provided the fluid viscosity is below about one stoke. The agreement between theory and experiment is unaffected by surface waves on the disc surface away from the edge or by the type of atomization at the disc edge (ligament or direct-drop). The effect of increasing either the fluid viscosity, surface tension or film thickness is to reduce the number of atomization sites while increasing the angular velocity increases the number.

LR-588 A COMPACT FORM OF THRUST DEFLECTOR: SYSTEM CONSIDERATIONS AND MODEL TESTS.

Tyler, R.A., Division of Mechanical Engineering, October 1975.

A compact form of thrust deflector, of possible application to existing turbofans, is described. The use of the deflector in various roles is discussed. The basic design allows, in principle, continuous variation of deflection from zero to design maximum with no effect on upstream flow conditions. In addition no upstream flow distortion should result from deflector installation. These expectations were confirmed by model tests on the balances of the NRC V/STOL propulsion tunnel. Two model versions (TDS 60 and TDS 130) with design maximum deflections of 60° and 130° were operated over a range of pressure ratio from 1.1 to 1.6 at various deflection settings from zero to maximum. In each case, test results indicated upstream flow conditions and deflector performance coefficients to be independent of deflection setting. Achieved maximum deflections were slightly (2°) in excess of design. Measured performance coefficients indicate that the thrust deflection system can be matched straightforwardly to appropriate existing engines with relatively small thrust losses (2 - 3% for TDS 60, 4% for TDS 130).

LR-589 A FLIGHT INVESTIGATION USING VARIABLE GLIDE PATH TRAJECTORIES TO COMPENSATE FOR WINDS AND MODERATE WIND SHEARS.

Hindson, W.S., Smith, R.E., National Aeronautical Establishment, February 1976.

The influence of wind, wind shears and turbulence on the approach and landing tasks of STOL and V/STOL aircraft has become of significant concern for this evolving class of flight vehicles, particularly during instrument flight operations. Flight experiments have been carried out to assess the considerations in alleviating the effects of along-track, *a priori* wind, including moderate shears, by adjusting the approach glide path for the conditions of the day. A Bell 205A helicopter modified as an airborne simulator and equipped with a modest programmable guidance and display capability was used for the tests, which were carried out in the operational environment of the Rockcliffe (Ottawa) STOLport.

LR-590 DROP SIZE AND RATE OF PRODUCTION FROM A SPINNING DISC.

Drummond, A.M., National Aeronautical Establishment, April 1976.

New experimental results on the primary drop size (d_p) and rate of drop production are presented. The effects of flow rate (Q), kinematic viscosity (ν) and disc spin rate (Ω) on d_p were measured. It is concluded that $d_p - d_0 (\nu, Q) = \text{constant}/\Omega$.

The detached volume has been measured as a function of Q , ν and Ω . Both the volume in the primary drop and the detached volume exceed the maximum critical volume of a static pendant drop. This indicates that the dynamics of drop formation must be included when attempting to formulate a predictive model for drop size. The Walton and Prewett model for drop size estimation from a spinning disc is critically examined.

LR-591 CONTROLLED AND UNCONTROLLED FLOW SEPARATION IN THREE DIMENSIONS.

Peake, D.J., National Aeronautical Establishment, July 1976.

The advantages of swept, sharp edges that generate controlled (or fixed) three-dimensional flow separations on a vehicle — because of the qualitatively unchanging flowfield developed throughout the range of flight conditions — are promoted in preference to allowing uncontrolled (or unfixed) separations.

The three-dimensional viscous flowfields and vortical interactions about typical components such as delta wings and bodies at incidence are discussed, in apposition to their use on selected examples of current flight vehicles.

LR-592 THREE-DIMENSIONAL SWEEP SHOCK/TURBULENT BOUNDARY-LAYER SEPARATIONS WITH CONTROL BY AIR INJECTION.

Peake, D.J., National Aeronautical Establishment, July 1976.

Experimentally determined wall pressure distributions, local surface shear stresses and their directions, and detailed turbulent boundary-layer traverses in near zero heat transfer conditions, are presented through skewed shock/boundary-layer interaction regions generated by a wedge standing normal to a test wall. The mainstream Mach numbers were 2 and 4, while the Reynolds number based on the undisturbed test boundary-layer thickness of 0.2-in., growing along the nozzle sidewall of the NAE 5 X 5-in. blowdown wind tunnel, was $\sim 2 \times 10^5$.

Tangential air injection at a jet exit Mach number of 3 was then introduced into the 3D shock separated Mach 2 boundary layer, to control the separation. The optimum direction of blowing was found to be along a line somewhere between the deflected surface of the wedge and the line of the oblique shock wave.

PART II — MECHANICAL ENGINEERING REPORTS

MD-53 ENERGY EQUIVALENTS FOR CURRENT AND PROSPECTIVE AUTOMOTIVE FUELS IN CANADA.

Coveney, D.B., Friend, M.J., Shulhan, G.M., Division of Mechanical Engineering, February 1976.

This report provides a first estimate of the comparative energy equivalents and the energy efficiencies of existing and prospective Canadian automotive fuels.

ME-242 THE ROTATING STATOR CONCEPT: EXPERIMENTAL PERFORMANCE CHARACTERISTICS COMPARED WITH THE CONVENTIONAL COMPRESSOR.

Chappell, M.S., Millar, D.A.J., Swiderski, A.A., Division of Mechanical Engineering, July 1975.

The Small Compressor Research Program is a co-operative project between the National Research Council of Canada (NRC) and Rolls Royce (Canada) Limited (RR). Its objectives are to investigate, both analytically and experimentally, the "Fanstat" concept of compressor spooling. This concept involves the co-rotation of both rotor and stator rows of a compressor in the core engine, with the fan being mounted on, and driven by, the rotating stator case. The primary function of the Fanstat is to provide an "aerodynamic gearbox" that will permit the fan and the fan turbine to run close to their individual optimum speeds, so overcoming the mismatch in blade speeds inherent in direct-coupled fan-turbine spools of high-bypass ratio turbofan engines.

The test results confirmed aerodynamic feasibility of the Fanstat arrangement of compressor spooling, and major performance parameters were not significantly different from the conventional compressor in the useful operating region. Flow range and surge behaviour of the co-rotating compressor were examined and, although somewhat unusual at various speeds, did not indicate any serious limitations on the applicability of the concept.

In general, the performance characteristics of the experimental Fanstat compressor substantiated the predictions of a hybrid-computer model and thus confirmed the latter as a useful and powerful tool for investigating the behaviour of this novel compressor arrangement.

ME-243 MODEL STUDY OF A PROPOSED ENGINEERING ACOUSTIC RESEARCH FACILITY.

Johnston, G.W., Rueter, F., Chappell, M.S., Division of Mechanical Engineering, July 1976.

A one-twelfth scale aeroacoustic model of a proposed engineering acoustic research facility has been tested to assess the background noise levels in the anechoic measurement area, and to develop a suitable exhaust collector for deflected jet conditions. The facility comprises an open circuit, open jet wind tunnel with an anechoic space surrounding the test section.

Collector configurations with acceptably low background noise and low sensitivity to jet deflection have been defined, but these features were achieved at the expense of some aerodynamic efficiency.

ME-244 CENTRIFUGAL BLOWER NOISE STUDIES: LITERATURE SURVEY AND NOISE MEASUREMENTS.

Krishnappa, G., Division of Mechanical Engineering, December 1976.

A review of the existing literature on the subject of centrifugal fan and blower noise studies is presented in this report, to establish further areas of research needed to aid in the development of a quiet blower. Noise measurements on a wide variety of blowers used in the laboratory, ranging from 1/3 to 700 horsepower are described with an object of identifying important frequency components from various types of blowers.

The existing literature suggests that the blade passing frequency tone and its harmonics are produced by the interaction of the flow issuing from the blade exit with the cut off edge formed by the junction of the blower casing and its exhaust duct and the random noise is generated by the unsteady flow processes within the impeller. The blower casing and ducted environment is shown to exert a powerful influence on noise characteristics. Among the various blowers tested, the prominent noise component appeared to be the tone at the blade passing frequency.

MI-837 NON-CONTACTING CAPACITIVE WAVE TRANSDUCERS. Part II: Design and Development of a Capacitive Wave-Transducer.

Zwarts, C.M.G., Division of Mechanical Engineering, May 1975.

A non-contacting capacitive wave transducer, using a horizontal electrode to sense the vertical distance to the water surface, has been developed to measure wave profile and amplitude in hydraulic models and flumes.

The factors determining accuracy are analyzed; circuits and practical design features are given.

MP-67 THE WEAR AND DAMAGE OF SHOTGUN BARRELS WITH PELLETS OF SOFT IRON AND LEAD — A FINAL REPORT.

Maloney, T., Division of Mechanical Engineering, May 1975.

The final series of experiments is described in which measurements are made on the wear and damage done to the barrels of superimposed and side-by-side shotguns, from which lead and soft iron were fired. A considerable amount of damage had occurred with the soft iron during the firing of 300 rounds or less, and subsequent firing of 700 rounds caused less severe damage. The lead pellets caused a measurable amount of wear but not of the same magnitude as the soft iron. The criteria established for a successful candidate to replace lead in shotshells has been met by the 50% lead-iron pellets previously evaluated and this program has therefore been concluded.

MP-68 BOILING RANGE DISTRIBUTION OF PETROLEUM FRACTIONS BY GAS CHROMATOGRAPHY.

Moon, G., Division of Mechanical Engineering, May 1975.

Gas chromatography has been found to be a useful technique for obtaining more detailed information concerning the boiling range distribution of petroleum fuels than that obtained by the standard distillation procedure. The application of an ASTM procedure, which utilizes gas chromatographic analysis, to the analysis of wide-cut aviation turbine fuels has been studied by the Fuels and Lubricants Laboratory and the results obtained and comments on the procedure are presented in this report.

MP-70 STUDY OF MIXTURES OF METHANE AND CARBON DIOXIDE AS FUELS IN A SINGLE CYLINDER ENGINE (CLR)

Wong, J.K.S., Division of Mechanical Engineering, September 1976.

A single cylinder four stroke engine (CLR) was used to investigate the feasibility of using mixtures of methane and carbon dioxide as an alternate fuel. Effects of fuel quality on engine power output and brake specific fuel consumption were investigated at 800, 1600, 2400, 2800 and 3200 rpm using full throttle setting with various spark timing, equivalence ratio and maximum load. Results indicated that using fuel mixtures having quality of 65/35 or better in methane and carbon dioxide ratio along with optimum spark timing and operating equivalence ratio corresponding to maximum fuel economy, engine power losses and brake specific fuel consumption increases could be kept below 10% compared to the maximum power produced with pure methane fuel.

MP-71 PRODUCTION OF A HYDROCARBON-TYPE SYNTHETIC FUEL FROM WOOD

Gardner, L., Division of Mechanical Engineering, September 1976.

As the world petroleum reserves become depleted considerable attention is being focussed on alternate sources of energy. In the short term, at least, the synthesis of hydrocarbon fuels similar in composition to present petroleum based fuels is the preferred choice for automotive use. Synthetic fuels of this type can be produced from coal, however the possibility of producing a similar fuel from wood has not been considered to any extent. A theoretical study of the production of fuels from wood via pyrolysis and the Fischer-Tropsch synthesis has therefore been made. The results of this study, as presented in this report, indicate that although technically feasible the production of such a fuel is financially and energy-wise uneconomical.

MS-135 STOICHIOMETRY OF CYCLOALIPHATIC EPIDE RESINS REACTED WITH PRIMARY AMINES.

McLean, P.D., Scott, R.F., National Aeronautical Establishment, November 1974.

This report is a study of the stoichiometry and its effect on tensile properties of several five and six membered ring cycloaliphatic epide resins reacted with the primary amine methylene dianiline. The results showed that up to 100% excess of the amine could be used successfully. Possible reasons for this phenomenon are discussed. The plastics exhibited high strength, high elongation and were predominantly ductile at failure.

**MS-136 ANALYSIS OF DRIVER CONTROL MOVEMENTS ON A LIMITED-ACCESS
DIVIDED HIGHWAY.**

Sewell, R.T., National Aeronautical Establishment, June 1975.

This report presents an analysis of basic control movements (steering wheel, accelerator pedal and brake) obtained in approximately 5,500 miles driving on a limited-access divided highway, using fourteen volunteer subjects (ten men and four women).

It is shown that the frequency and magnitude of steering wheel movements (reversals) are dependent upon vehicle speed and traffic density. The increase in frequency of small magnitude reversals with increasing vehicle speed and/or traffic density reflects the greater task difficulty imposed upon the driver in these conditions.

The principal uses of basic control movement data of the nature described in this report are in the assessment of differences in behaviour in a given set of circumstances, and the determination of task difficulty.

There is evidence to show that such data may also be used as a means of identifying 'accident-prone' drivers. However, these data appear to be of little value in assessing the relative skill or experience of individual drivers.

**MS-137 NEUTRAL DENSITY PAINT MIXTURES PROVIDING PREDICTABLE DIFFUSE
SURFACE REFLECTIVITY FOR VISIBILITY STUDIES.**

Ayad, A.A., National Aeronautical Establishment, March 1976.

A method was devised to produce neutral density targets with predictable reflective properties.

At present the targets are used in connection with studies in night driving visibility; however, the method presented has a wide range of applications.

In the case of visibility experiments, the report develops a methodology allowing for the standardization of reflectance measurements between the various laboratories presently involved in the field.

**MS-138 APPLICATION OF A PHOTOGRAPHIC METHOD TO STUDY THE LUMINANCE
DISTRIBUTION GOVERNING VISIBILITY IN NIGHT DRIVING.**

Pinkney, H.F.L., Ayad, A.A., Walker, A.C., National Aeronautical Establishment, April 1976.

The report describes a photographic method which has been developed to provide qualitative and quantitative records of the low level luminance distribution of a highway and different arrangements of obstacles (targets) in a program of studies on automobile headlighting.

The method allows for the optimization of the measurement relationship between luminance and density, and of the negative film latitude and contrast.

In addition to providing quantitative measurements, the high quality photographs reveal important phenomenological effects resulting from the interaction of two (or more) sources of illumination for a range of obstacle and pavement reflectance and leading to conditions of positive, negative and null contrast.

PART III — TEST REPORTS

MET-515 THE CALIBRATION OF A DEUTZ F8L413 DIESEL AND DEVELOPMENT OF AN ON-BOARD BHP INDICATOR.

Heggie, W.S., Division of Mechanical Engineering, February 1975.

The calibration of a Deutz F8L413 diesel engine, emphasizing characteristics pertinent to the levitation of an Air Cushion Vehicle is described, together with the development of an output indicating device to be used aboard the craft. The opportunity was also taken to install NRC developed transducers for recording cylinder and fuel injection pressure-time phenomena, with the object of subjecting them to field endurance tests.

Output and fuel consumption compared reasonably with manufacturer's data and a horse-power readout system was developed, based on fuel rack position and rotational speed.

PART IV — FEATURE ARTICLES FROM QUARTERLY BULLETINS

AN APPROXIMATE HYDRODYNAMIC CODE, by P. Huculak. Reprint from DME/NAE Quarterly Bulletin 1974(1), April 1974.

PROGRAMMING THE NAE FLYING SPOT SCANNER/ANALYSER, by H.N.C. Lyster. Reprint from DME/NAE Quarterly Bulletin 1974(1), April 1974.

PROGRESS IN THE DEVELOPMENT OF A VERSATILE AIRBORNE SIMULATOR FOR V/STOL AIRCRAFT, by W.S. Hindson, K. Lum and W.E.B. Roderick. Reprint from DME/NAE Quarterly Bulletin 1974(1), April 1974.

WIND POWER AND THE VERTICAL-AXIS WIND TURBINE DEVELOPED AT THE NATIONAL RESEARCH COUNCIL, by R.S. Rangi, P. South and R.J. Templin. Reprint from DME/NAE Quarterly Bulletin 1974(2), July 1974.

PROSPECTS FOR VARIABLE GEOMETRY COMPRESSORS IN AUTOMOTIVE GAS TURBINES, by G.M. Shulhan. Reprint from DME/NAE Quarterly Bulletin 1974(2), July 1974.

ELECTROMAGNETIC FIELDS AND WOUND REPAIR, by C. Romero-Sierra, S. Halter and J.A. Tanner. Reprint from DME/NAE Quarterly Bulletin 1974(2), July 1974.

PREDICTION OF SIGMA PHASE FORMATION IN HIGH TEMPERATURE ALLOYS, by W. Wallace. Reprint from DME/NAE Quarterly Bulletin 1974(3), October 1974.

AEROTHERMODYNAMIC FACTORS GOVERNING THE RESPONSE RATE OF GAS TURBINES, by B.D. MacIsaac and H.I.H. Saravanamuttoo. Reprint from DME/NAE Quarterly Bulletin 1974(3), October 1974.

ESTIMATES OF THE STABILITY DERIVATIVES OF A HELICOPTER AND A V/STOL AIRCRAFT FROM FLIGHT DATA, by D.G. Gould and W.S. Hindson. Reprint from DME/NAE Quarterly Bulletin 1974(4), January 1975.

SOME AIR CUSHION TECHNOLOGY RESEARCH IN CANADA, by H.S. Fowler. Reprint from DME/NAE Quarterly Bulletin 1974(4), January 1975.

THE NATURE OF THERMODYNAMIC CYCLES AND THERMODYNAMIC EFFICIENCY, by T.A. Ledwell. Reprint from DME/NAE Quarterly Bulletin 1974(4), January 1975.

A TRANSMISSION LINE WAVE HEIGHT AND LEVEL TRANSDUCER, by C.G.M. Zwarts. Reprint from DME/NAE Quarterly Bulletin 1975(1), April 1975.

ICING OF FISHING VESSELS IN CANADIAN WATERS, by J.R. Stallabrass. Reprint from DME/NAE Quarterly Bulletin 1975(1), April 1975.

LIFT, by W.E. Laundry. Reprint from DME/NAE Quarterly Bulletin 1975(2), July 1975.

CIRCADIAN RHYTHM IN PERFORMANCE ON THE NRC STRESSALYSER, by Leslie Buck and Ralph Leonardo. Reprint from DME/NAE Quarterly Bulletin 1975(2), July 1975.

INTERACTIVE COMPUTER MODELS OF INDUSTRIAL OPERATIONS, by U. Graefe, L.K. Nenonen and K. Strobele. Reprint from DME/NAE Quarterly Bulletin 1975(2), July 1975.

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